



AGRICULTURAL WATER USE AND DEVELOPMENT PLAN UPDATE

2017

**Hawaii Department of Agriculture
Agricultural Resource Management Division**

2017 AWUDP UPDATE OBJECTIVES

- Provide status update of the capital improvement projects
- Inventory of irrigations systems that were not covered in 2004 AWUDP Revision
- Develop water demand and forecast
- Development plan

Note:

*The content of this presentation is in-progress, draft information.
It should not be construed as formal Department of Agriculture findings.*

2004 IRRIGATION SYSTEMS

Privately Owned Systems

- Kauai Coffee
- Maui Land and Pineapple/Pioneer Mill
- East Maui
- West Maui

Agribusiness Development Corp.

- East Kauai
- Kekaha Ditch
- Kokee Ditch
- Waiahole Ditch

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- Lower Hamakua Ditch
- Molokai
- Upcountry Maui
- Waimanalo
- Waimea











2017 IRRIGATION SYSTEMS – ACCESS NOT ALLOWED

- Kalihiway (Kaloko portion), Kauai – Per owner, system is not active and assessment is not necessary
- Upper and Lower Lihue Ditches, Kauai – Access denied
- Upper and Lower Haiku Ditches, Kauai – Access denied
- Waiaha-Kula, Kauai (portions denied) – Access denied
- Olokele Ditch, Kauai – Owners are maintain the ditch system and there are “adequate water resources” for farmers
- Opaeula, Kamananui, and Ito, Oahu – Declined participation
- Kohala, Hawaii – Declined participation

2017 IRRIGATION SYSTEMS – ACCESS ALLOWED

- Kalihiwai (Stone Dam portion), Kauai – relatively good condition
- Anahola (DHHL Portion), Kauai – fair to poor condition
- Waiaha-Kula (A&B), Kauai
(Partial access to Lawai section only) – good condition
- Oahu Ditch, Oahu – fair to good condition
- Kahuku Water (ARMD), Oahu – generally good condition
- Galbraith Lands (ADC), Oahu – generally good condition
- Kehena, Hawaii – generally fair to good condition







2017 IRRIGATION SYSTEM FINDINGS

- Most systems over 100 years old
- Maintenance and improvements beneficial
- Access not allowed to all systems
 - Could not evaluate status
 - Could not assess future needs
 - Could not verify crops within service area

2017 WATER DEMAND APPROACH

HISTORICAL DIVERSIFIED AGRICULTURE AND WATER DEMAND

- Diversified Agriculture is not a “relatively young” industry
 - Pre-contact diversified agriculture evidence - sweet potato, taro, bananas, sugarcane, gourds in Kohala field system
 - 1937 – published statistics on the production of sugar cane, pineapple, grazing, rice, taro, avocado, bananas, other field crops, fruit crops, coffee, nuts, papaya, and vegetables
- Historical water demand
 - Pre-contact Hawaiians regulated the water to the taro fields to ensure downstream users had water
 - 1959 - sugarcane water demand: 7,000 – 10,000 gals/acre/day

HDOA IRRIGATION WATER USE GUIDELINES (2004 AWUDP)

Crop	Water Use Rate (gals/acre/day)	Crop	Water Use Rate (gals/acre/day)
Alfalfa/Corn (grain)	7,700	Orchids	3,700
Aquaculture	145,000	Papaya	5,000
Dendrobium	4,000	Passion Fruit	10,000
Field Crops (grass & seed)	6,700	Pineapple	1,350
Foliage Plants	4,000 - 6,000	Protea	2,000-2,500
Forage Crops	7,400	Sugarcane (drip)	6,700
Guava	4,400	Sugarcane (furrow)	10,000
Leafy Vegetables (drip)	4,050	Taro (Asian)	4,000 - 8,000
Leafy Vegetables (sprinkler)	5,400	Taro (dryland)	5,400
Macadamia Nuts	4,400	Taro (wetland)	80,000 - 100,000
Nursery (potted plants)	6,000	Vegetables	6,700







WATER DEMAND BY LOCATION AND RAINFALL

Location	Average Dry Season in gal/acre/mo (and gal/acre/day) ¹	Average Wet Season in gal/acre/mo (and gal/acre/day) ¹	Estimated Average Water Usage in gal/acre/mo (and gal/acre/day) ¹	Average Annual Rainfall (in) ²	Vegetation Zone ³
Pahoa	0 – 154,286 (0 – 5,143)	0 – 142,000 (0-4,733)	27,075 (901)	134	D1
Panaewa	1 – 403,517 (0- 13,451)	0 – 28,571 (0-952)	27,994 (933)	129 – 140	D1
Keahole	22,125-2,666,667 (738 – 88,889)	22,125-2,666,667 (738 – 88,889)	538,843 (17,961)	18	A
Kula	9,000 – 756,144 (300 – 25,205)	0 – 250,000 (0-8,333)	204,995 (6,833)	16 – 27	B
Molokai	1,931 – 3,000,000 (64 – 100,000)	1,931 – 1,000,000 (64 – 33,333)	316,542 (10,551)	17 – 21	A&B
Mililani	3,600 – 2,000,000 (120 – 66,667)	0 – 1,600,000 (0 – 53,333)	303,975 (10,133)	26 - 37	B
Waimanalo	74 – 257,143 (2 – 8,571)	42 – 230,625 (1 – 7,688)	47,707 (1,590)	51 – 67	C1&D1
Kahuku	5,273 – 1,212,121 (176 – 40,404)	0 – 163,636 (0 – 5,455)	131,725 (4,391)	43 – 52	B-C1
Kauai	36 – 108,000 (1 – 3,600)	0 – 17,000 (0 – 567)	15,136 (505)	45 - 52	C1

Notes: 1. Farm acreage is based on planted area. Range of average volumes per farm.

2. Giambelluca, T.W., et.al., “Online Rainfall Atlas of Hawaii”

3. Ripperton and Hosaka, “Vegetation Zones of Hawaii”

LOWER HAMAKUA DITCH
AVERAGE DAILY DEMAND (gal/acre/day)
(1990 Summary Crop Water Demand for Peak Month)

		Crop Water Demand Below 500 feet			Crop Water Demand Above 500 feet	
Rainfall		50%	80%		50%	80%
Banana		6,133	6,733		4,733	5,467
Coffee		4,600	5,167		3,367	4,067
Papaya		4,600	5,167		3,367	4,067
Macadamia nut		3,833	4,367		2,733	3,367
Foliage/flowers		5,367	5,933		4,067	4,767
Truck Crops		3,833	4,367		2,733	3,367
Reference Crop		4,700	5,300		3,500	4,200
<i>Effective Peak Month</i>		<i>1.67</i>	<i>1.25</i>		<i>2.21</i>	<i>1.66</i>
<i>Rainfall (inches)</i>						

IRRIGATION METHOD AND WATER DEMAND

Irrigation Method	Wet Season in gal/acre/mo (gal/acre/day)	Dry Season in gal/acre/mo (gal/acre/day)
Drip	96,634 (3,220)	228,335 (7,611)
Sprinkler	180,270 (6,009)	231,119 (7,703)
Water Hose	137,459 (4,582)	163,685 (5,456)
Aquaculture	142,200 (4,740)	142,200 (4,740)

COMPARISON OF IWREDSS RESULTS

Surveyed Farm Area	Irrigation Demand of Surveyed Farms (gal/acre/day)	IWREDSS GIR	
		Normal Rainfall, 50% Probability (gal/acre/day)	Severe Drought, 95% Probability (gal/acre/day)
Waimanalo	490 – 1,104	1,085 – 1,786	1,776 – 2,340
Kula (lower)	4,508 – 12,545	2,805 – 3,491	3,292 – 3,978

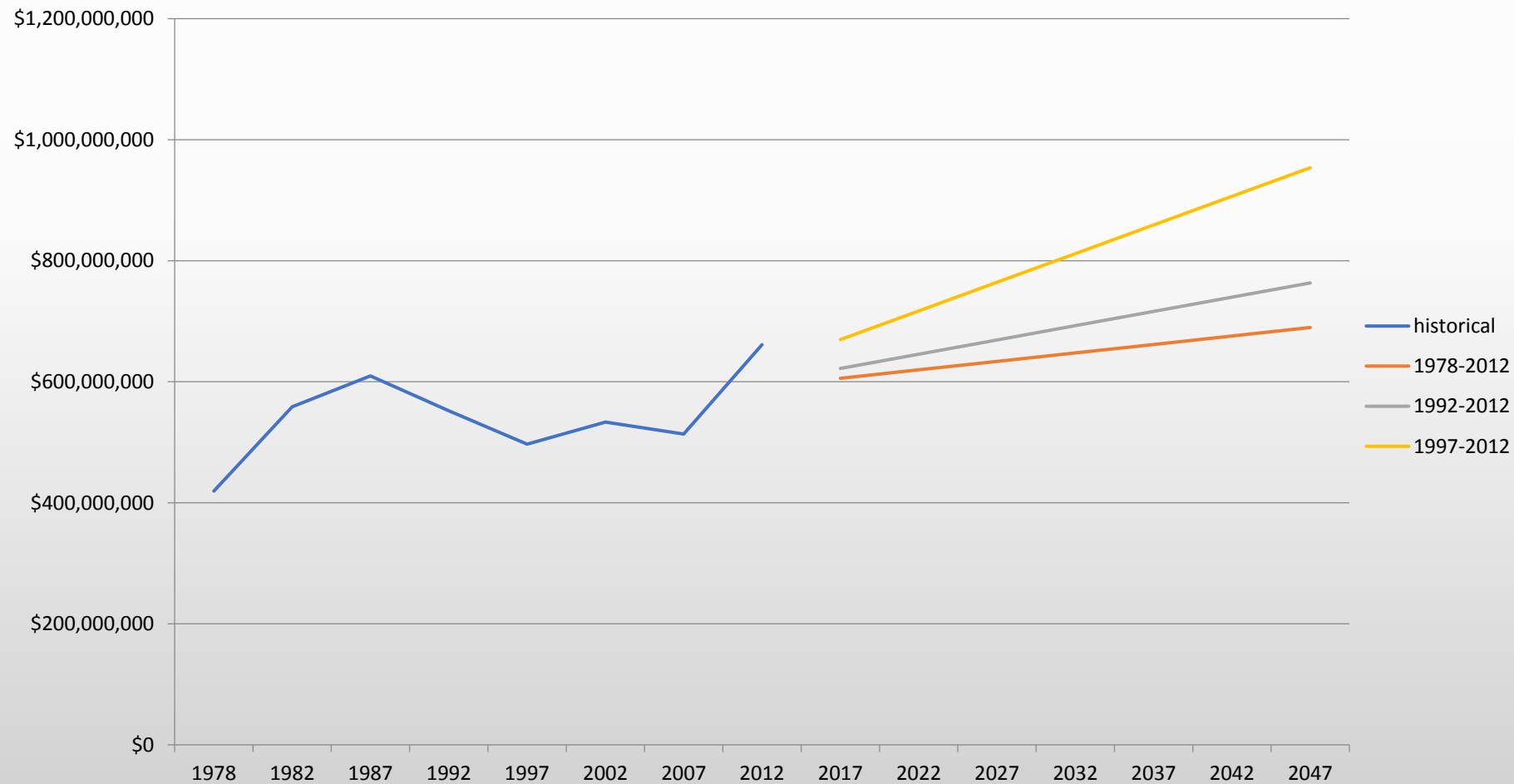
Note: IWREDSS runs are based on annual generic crop, with drip irrigation, and SCS = 78. Results are Gross Irrigation Requirements (GIR)

WATER DEMAND LIMITATIONS

- Water demand variables
- Limited data available
- Farmers are protective of their water usage numbers

AGRICULTURE FORECAST

Hawaii Farm Values (NASS data)



FORECAST

- Irrigation Systems Forecast
 - No maintenance, no improvements
 - Adequate maintenance level
 - Increased improvements and maintenance
- Development Plan
 - Recommendations

Thank You

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